ENERGY EFFICIENCY AND RENEWABLE ENERGY

OFFICE OF TRANSPORTATION TECHNOLOGIES

The Partnership for a New Generation of Vehicles Update

Government/industry partnering to achieve technology advancements towards an 80-mpg automobile

Transportation

FOR THE 21ST CENTURY

A major milestone – Partnership for a New Generation of Vehicles (PNGV) Concept Cars unveiled

A major program milestone was met, on schedule, in early 2000, when DaimlerChrysler, Ford, and General Motors each unveiled separate Concept Cars capable of 70-80 mpg (gasoline equivalent) while having room for a family of five. Born of six years of leading-edge research and development, the Concept Cars utilize such advanced technologies as hybrid diesel-electric propulsion systems; regenerative braking; nickel-metal hydride and lithium-ion batteries; and lightweight composite and aluminum intensive vehicle bodies. Each vehicle is described below:

DaimlerChrysler ESX3

- Powered by a small, three-cylinder diesel engine mated to an electric motor that drives the front wheels.
- Goes from 0 to 60 mph in about 11 seconds.
- Fuel economy: 72 mpg (gasoline equivalent) on diesel fuel.
- Weighs 2,250 pounds, about 1,200 pounds less than the similarly sized Dodge Intrepid sedan.
- Exceeds current Federal emissions standards.

Ford Prodigy

- Powered by a small, four-cylinder turbocharged diesel engine and an electric motor linked to a nickel-metal hydride battery pack in the trunk.
- Replaces rearview mirrors with video cameras to reduce drag.
- Other aerodynamic features include a smooth underbody, special wheel covers, and vents in the front grille that open only when the engine needs extra air.
- Fuel economy: nearly 72 mpg (gasoline equivalent) on diesel fuel.
- Built mostly of aluminum with some lightweight magnesium and titanium components.
- Weighs 2,387 pounds, about 1,000 pounds less than production mid-size sedans.

General Motors Precept

- World's most aerodynamic 5-passenger family sedan.
- Diesel engine and battery-powered electric motor.
- Nickel-metal hydride or lithium battery (both under development).
- Aluminum alloy frame and skin with polymeric roof panel, fascia, and rockers.
- Fuel economy: 80 mpg (gasoline equivalent) on diesel fuel.
- Weighs 2,875 pounds.

Significant technical accomplishments

Many of the partnership's technological achievements are, or soon will be, used in production vehicles. These include:

- a hybrid electric drive option for greatly increased fuel economy to be offered on the 2002 Dodge Durango, 2003 Ford Escape, 2005 Ford Explorer, and the 2004 Chevrolet Silverado;
- GM will offer hybrid electric drive options on high-volume sedans, hatchbacks, and sport wagons by 2004;
- a new, lighter, recyclable thermoplastic hardtop for the 2001 Jeep Wrangler;
- use of 412 pounds of lightweight aluminum in the 2000 Lincoln LS, thereby reducing vehicle weight by 188 pounds;
- a new, 50-pound lighter composite pickup truck box on the 2001 Chevrolet Silverado;
- an all-composite, one-piece sport utility vehicle/truck bed for the Ford Explorer Sport Trac which drew from improvements in durability and adhesive bonding;
- complete demonstration of thin-slab continuous casting of aluminum; and
- advanced laser welding techniques.

PNGV—a matter of great national importance

The partnership was created to provide significant economic, environmental, and energy security benefits to the nation. With a growing population and continued increases in travel, a significant improvement in vehicle fuel

DaimlerChrysler ESX3

Ford Prodigy

General Motors Precept

economy would lessen our vulnerability to energy price fluctuations. The partnership is providing the technologies that will make a difference. Also, because automobiles are a major source of atmospheric pollutants and carbon dioxide, increases in engine efficiency will result in corresponding decreases in air emissions.

The industrial partner of the PNGV is the United States Council for Automotive Research, representing DaimlerChrysler, Ford, and General Motors. The government partners include the Departments of Commerce, Energy, Transportation, and Defense along with the Environmental Protection Agency, National Science Foundation, and the National Aeronautics and Space Administration. The backbone of the partnership is a coordinated portfolio of hundreds of research projects underway at national laboratories, auto companies, suppliers, small businesses, and university research facilities.

PNGV partnership narrows focus to the most promising technologies

In January 1998, after four years of intensive research and development, the program focus was narrowed down to those technologies considered to be the most promising for achieving the partnership's goals. Research efforts are now concentrated in four key system areas:

- Direct-injection internal combustion engines, where precise amounts of fuel are injected directly into each cylinder, offer the promise of increased fuel economy and reduced emissions.
- Fuel cell systems which produce electricity by an electrochemical process, and have the potential to be 100 times cleaner than conventional automobile engines.
- Hybrid electric vehicles whose drivetrains feature two power sources: an energy conversion device (internal combustion engine or fuel cell) that uses hydrocarbon fuel, and an energy storage device (high power nickel-metal hydride or lithium-ion battery.)
- Lightweight materials, such as aluminum, magnesium, polymer composites and titanium. Also, dissimilar materials joining techniques and high-volume production technologies are being developed to reduce mid-sized car weight below 3,300 lbs. Such a weight reduction, in combination with improved drivetrain efficiencies, is required to achieve 80 mpg.

Still more to be done

There are still technical as well as cost and manufacturing barriers that must be overcome before an 80-mpg vehicle can be produced. The next major milestone occurs in 2004, when production prototype vehicles will be displayed by each of the participating car companies. Members of both government and industry have stated a desire to see this successful research partnership continue beyond the 2004 milestone.

For more information on the Partnership for a New Generation of Vehicles, visit our Web site at: http://www.ta.doc.gov/pngv.

For more information on how DOE is helping America remain competitive in the 21st century, please contact:

Ed Wall
Office of Transportation Technologies
(202) 586-0410
ed.wall@ee.doe.gov
http://www.ott.doe.gov

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